

KINGSTON

**water pollution
control plant**

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ONTARIO WATER RESOURCES COMMISSION

Division of Plant Operations

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ONTARIO WATER RESOURCES COMMISSION
OFFICE OF THE GENERAL MANAGER

Members of the Kingston Local Advisory Committee,
Township of Kingston.

Gentlemen:

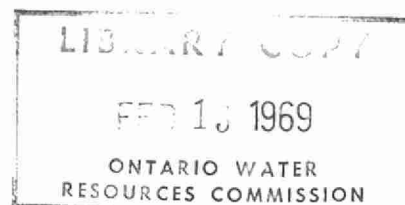
We are happy to present you with the 1967 Operating Summary for the Kingston Township Water Pollution Control Plant, OWRC Project No. 2-0098-61.

Your co-operation with our staff throughout the year has been appreciated. Only with such co-operation can the war against water pollution be waged effectively.

Yours very truly,

A handwritten signature in dark ink, appearing to read "D. S. Caverly".

D. S. Caverly,
General Manager.



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ONTARIO WATER RESOURCES COMMISSION

801 BAY STREET
TORONTO 5

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J. H. H. ROOT, M.P.P.
VICE-CHAIRMAN

D. S. CAVERLY
GENERAL MANAGER

W. S. MACDONNELL
COMMISSION SECRETARY

General Manager,
Ontario Water Resources Commission.

Dear Sir:

I am pleased to submit to you the 1967 Operating Summary for the Kingston Township Water Pollution Control Plant, OWRC Project No. 2-0098-61.

The summary reviews progress during the year, outlines operating problems encountered and summarizes in graphs, charts and tables all significant flow and cost data.

Yours very truly,

A handwritten signature in cursive script, reading "D. A. McTavish".

D. A. McTavish, P. Eng.,
Director,
Division of Plant Operations.

FOREWORD

● This operating summary has been prepared in order to acquaint readers with the management of the project during 1967. The efficiency of the plant's operation is reflected in a general review. Significant financial details are recorded, and technical performance is illustrated by graphs and charts.

The summary should answer two salient questions. Are the project's facilities adequate at this time? And can the project meet future requirements?

The Regional Operations Engineer is primarily responsible for the preparation of the report, and will be pleased to answer any questions regarding it.

Most of the material for the graphs and charts was compiled by the statistics section of the Division of Plant Operations, with the final versions of the graphs being drawn by the draughting section of the Division of Sanitary Engineering. Cost data were provided by the Division of Finance.

It will be evident from the report that all of these groups co-operated with substantial success.

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KINGSTON
water pollution control plant
operated for

THE TOWNSHIP OF KINGSTON

by the

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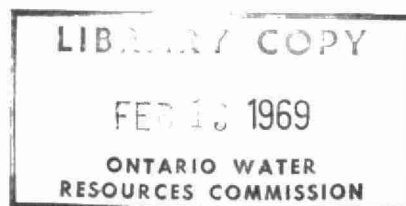
W. S. MacDonnell

DIVISION OF PLANT OPERATIONS

DIRECTOR: D. A. McTavish

Assistant Director: C. W. Perry
Regional Supervisor: P. J. Osmond
Operations Engineer: J. N. Dick

801 Bay Street Toronto 5



'67 REVIEW

In 1967, the Township of Kingston Water Pollution Control Plant treated a total of 258 million gallons of sewage. This represents an average daily flow of 700,000 gallons from the 186 million gallons treated the previous year.

The operating cost for the treatment plant and the associated pumping stations in 1967, was \$30,775.98. The cost to treat 1 million gallons of sewage in 1967 was \$119.02. This represents a decrease of \$18.50 per million gallons of waste treated in 1966 in spite of the fact that total operating costs in 1967 increased.

The average concentration of BOD and suspended solids in the influent to the plant were 291 and 810 ppm respectively. The BOD and suspended solids in the plant effluent were 15 and 19 ppm respectively. This represents a percent reduction in BOD of 91 and in suspended solids of 96.

In 1967, the plant process was upset on numerous occasions due to the dumping of septic tank contents into the sewer system. The plant developed very high sludge volume indices due to this with the result that solids escaped over the final tank weirs into the receiving stream. The thick sludge (septic tank dumpings) which passed through the Day's Road pumping station, blocked the seal water to the pump seals and eight seals in all had to be replaced at a total material cost of eight hundred and ten dollars. The increased loading on the plant (due to septic tank dumpings) also ad-

versely affected the disposal of digested sludge. The existing drying beds could not handle all the digested sludge produced with the result that liquid sludge hauling had to be initiated in the latter part of the year.

Nylon from the Dupont Company of Canada Limited found its way into the sewers and caused minor operating difficulties at the plant as the nylon would enmesh and clog the various pieces of equipment.

The waste gas burner was relocated from its position near the sludge drying beds to the roof of the Administration Building. This was done to eliminate the freezing of the gas line. The plant flow meter was also modified in that the peak flow measureable was increased to 2 1/2 million gallons per day from the previous maximum of 1 million gallons per day. To improve the operation of the boiler on sewage gas, weights were added to the digester roof to increase the pressure by approximately 1 inch water column.

The Township of Kingston entered into an operating agreement with the OWRC to operating the newly constructed pumping station on Highway #33 near the new shopping plaza.

The R. V. Anderson Report was reviewed with the Township Council in the latter part of November. It was felt that some modifications to the report were necessary.

The plant staff was increased to a complement of three in 1967 with the hiring of Mr. C. Caird as operator.

The plant was inspected routinely by head office engineers and technicians and found to be in satisfactory condition.

PROJECT COSTS

NET CAPITAL COST (Estimated)		\$1,531,682.15
DEDUCT - Payments from Municipalities	\$156,782.00	
- Portion Financed by CMHC (Estimated)	431,721.56	<u>588,503.56</u>
Long Term Debt to OWRC		\$ <u>943,178.59</u>
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1967		\$ -
Debt Retirement		\$ -
Reserve		9,536.17
Interest Charged		53,090.60
Net Operating		<u>30,775.98</u>
TOTAL		\$ <u>93,402.75</u>

RESERVE ACCOUNT

Balance at January 1, 1967	\$ 29,040.07
Deposited by Municipality	9,536.17
Interest Earned	<u>1,595.90</u>
	\$ 40,172.14
Less Expenditures	<u>(6,853.83)</u>
Balance at December 31, 1967	\$ <u>33,318.31</u>

MONTHLY OPERATING COSTS

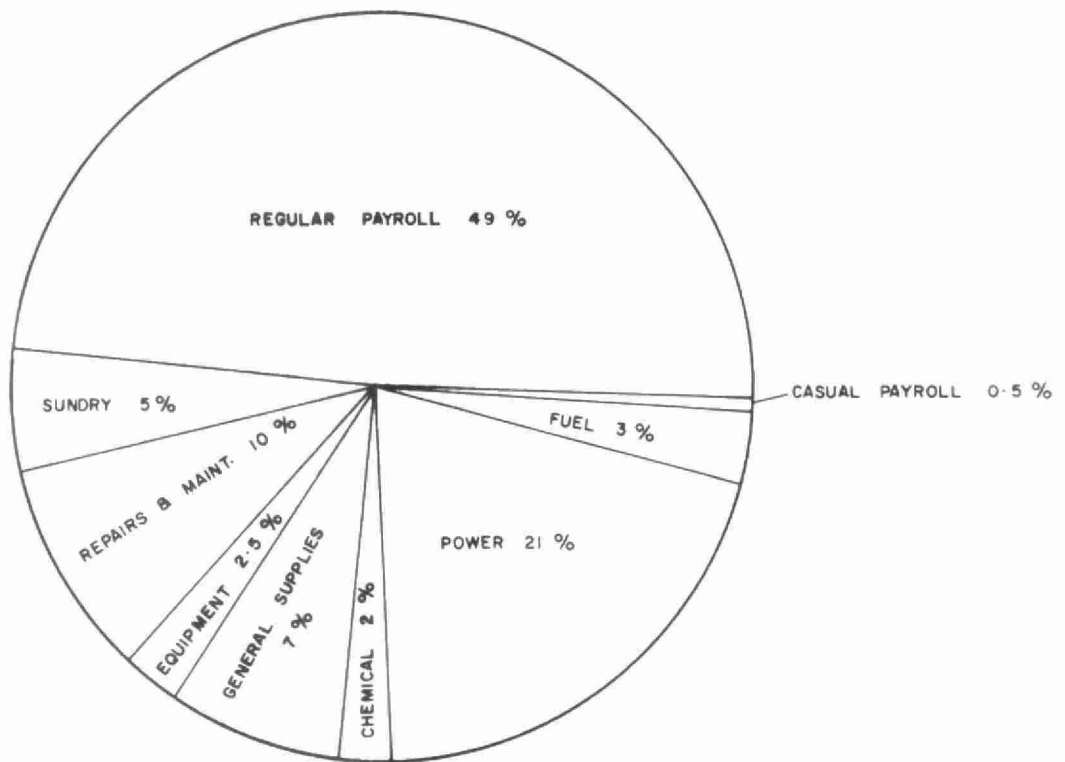
MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	SUNDRY
JAN	1,693.00	851.09	60.87		443.62		55.03	45.12	237.27	
FEB	1,716.63	832.97	6.00		519.53		83.38		232.51	42.24
MARCH	2,418.53	1362.63	85.10	334.72	457.58		241.80		(164.35)	101.05
APRIL	2,684.75	972.56	48.23		432.65		129.55	(9.77)	1073.54	37.99
MAY	2,602.30	1315.52	8.06	102.90	552.06	228.38	366.98		(23.06)	51.46
JUNE	2,661.18	1231.70		117.60	503.56	228.38	298.96		130.41	150.57
JULY	2,623.58	1260.07			517.87		238.02	154.68	351.20	101.74
AUG	2,145.02	1293.71		88.20	480.90		127.49		115.55	39.17
SEPT	3,251.48	1935.79			648.10		200.78	93.66	224.34	148.81
OCT	2,634.71	1271.02		117.60	526.76	228.38	136.21	49.00	251.04	54.70
NOV	3,305.40	1399.82			607.83		60.89	384.61	175.79	676.46
DEC	3,039.40	1292.50		205.80	621.29		332.07	70.60	312.11	205.03
TOTAL	30,775.98	15019.38	208.26	966.82	6311.75	685.14	2271.16	787.90	2916.35	1609.22

BRACKETS INDICATE CREDIT

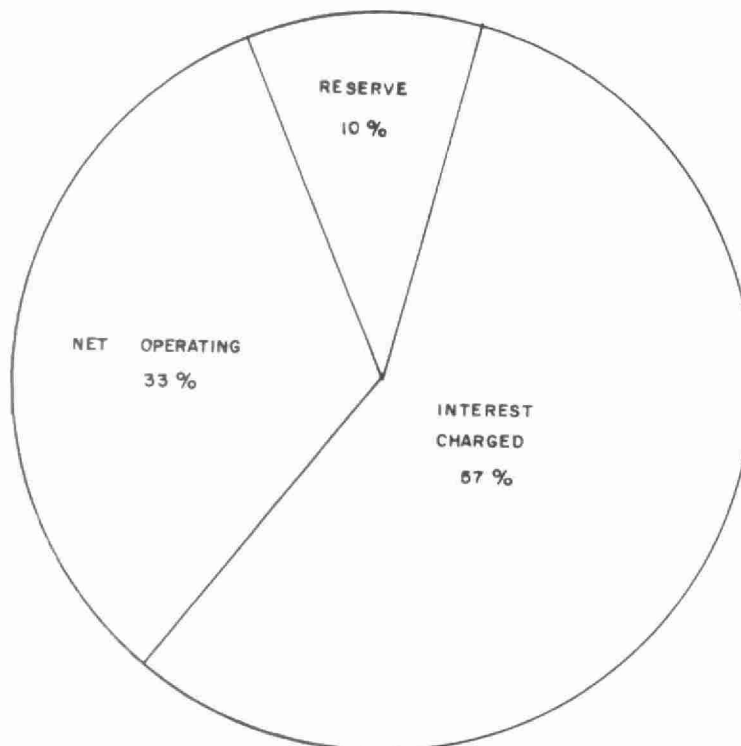
YEARLY OPERATING COSTS

YEAR	M.G. TREATED	TOTAL COST	COST PER MILLION GALLONS	COST PER LB OF BOD REMOVED
1964	111.630	\$23,296.77	\$214.34	43 ¹ / ₂ CENTS
1965	181.105	23,348.09	128.92	10 CENTS
1966	186.699	25,674.25	137.52	7 CENTS
1967	258.570	30,775.98	119.02	4 CENTS

1967 OPERATING COSTS



TOTAL ANNUAL COST



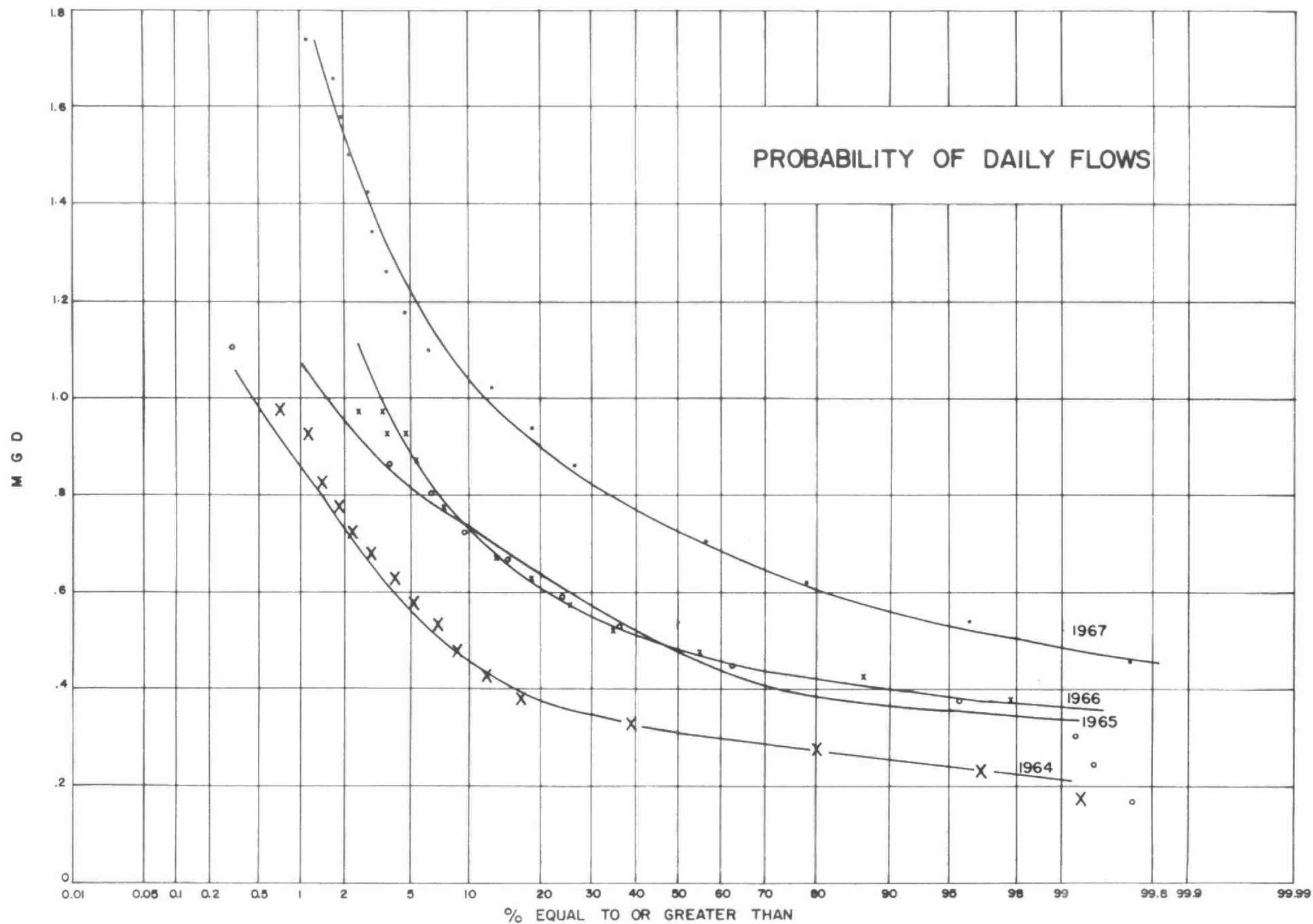
Process Data

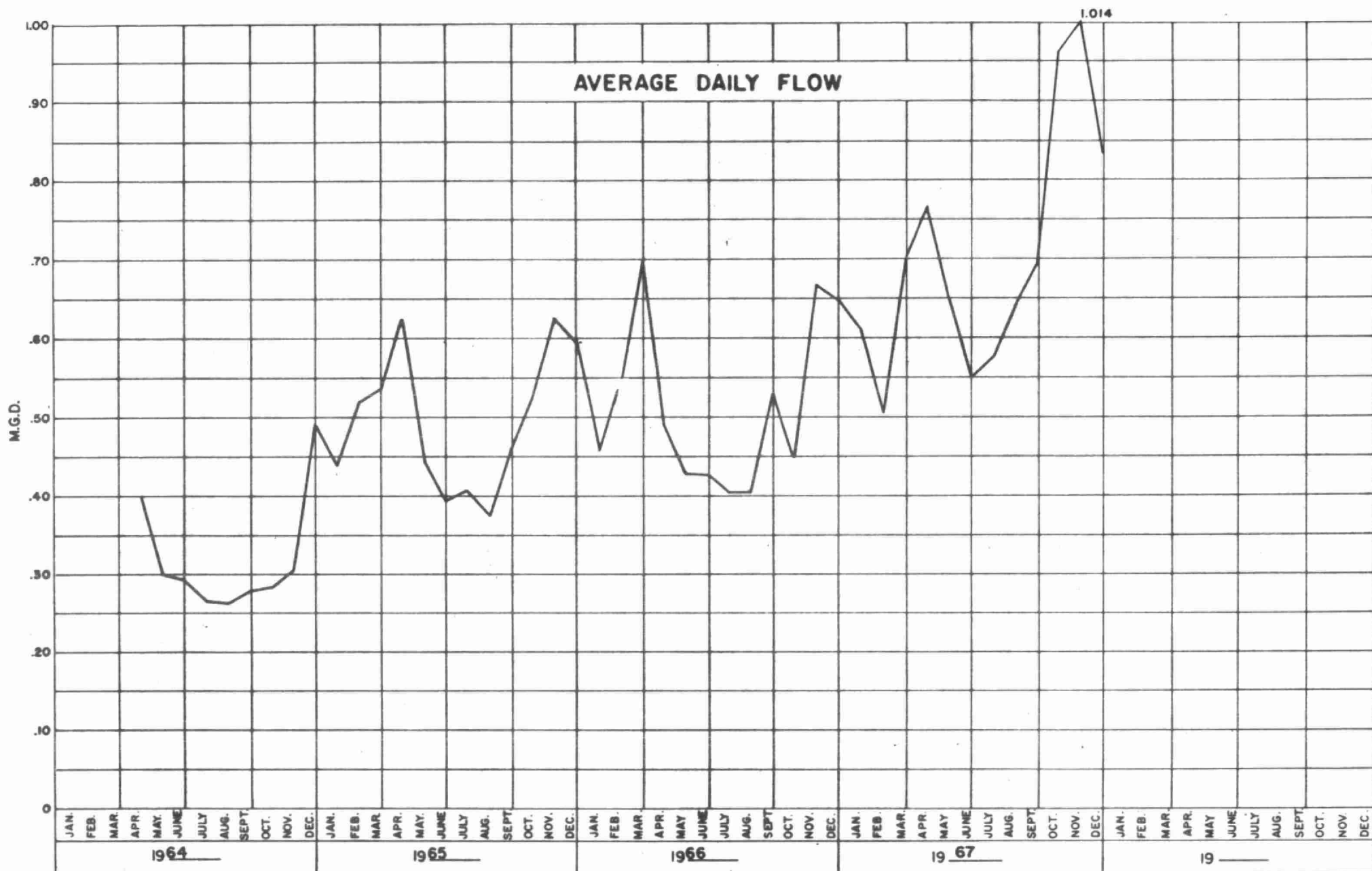
PROBABILITY OF FLOWS

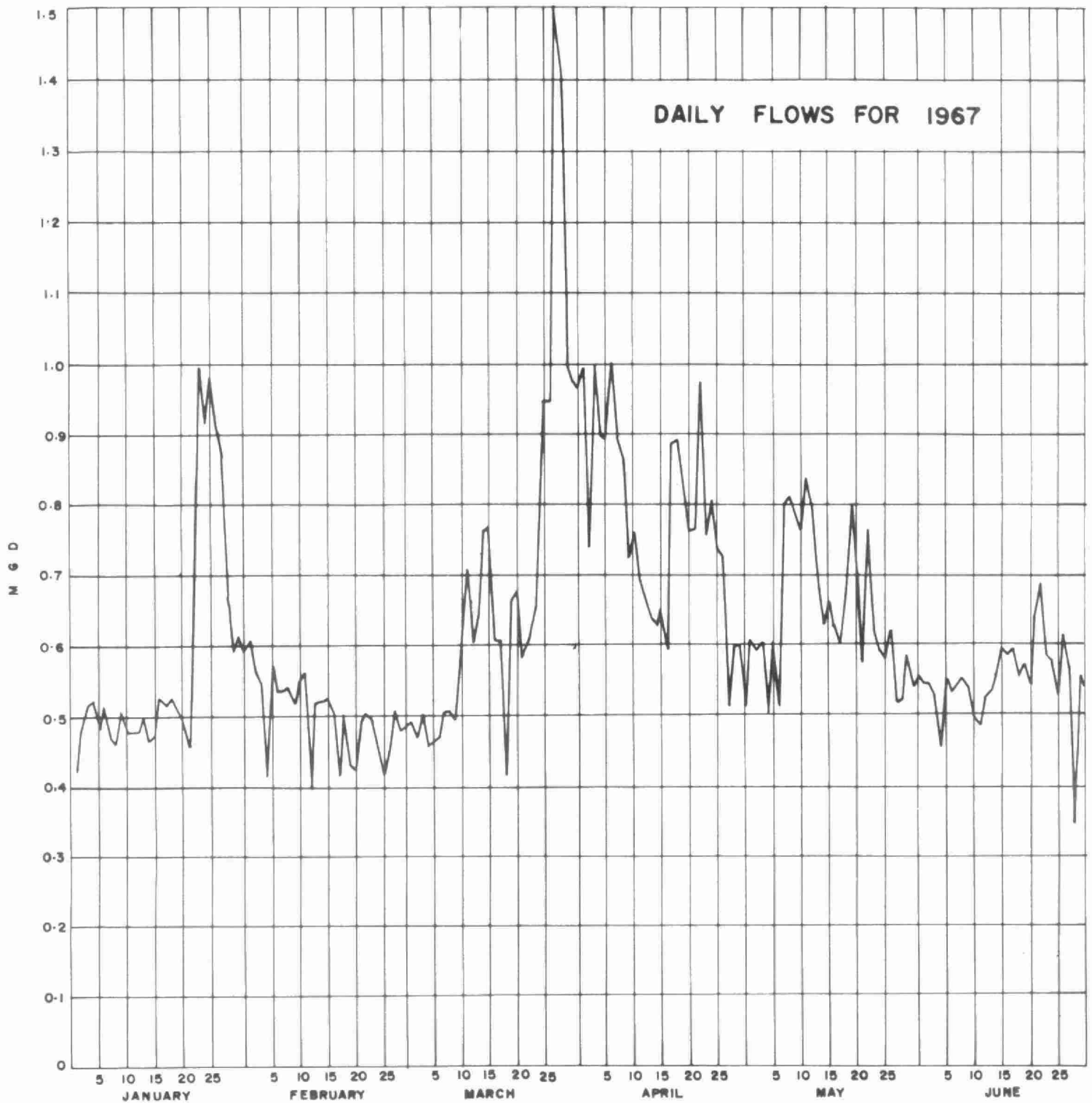
The Probability of Flows Graph showed that the flows to the plant had increased in 1967. The graph showed that 50 percent of the time the flows to the plant were approximately 730,000 gallons per day and exceeded the plant design flow of 1 million gallons per day approximately 12 percent of the time.

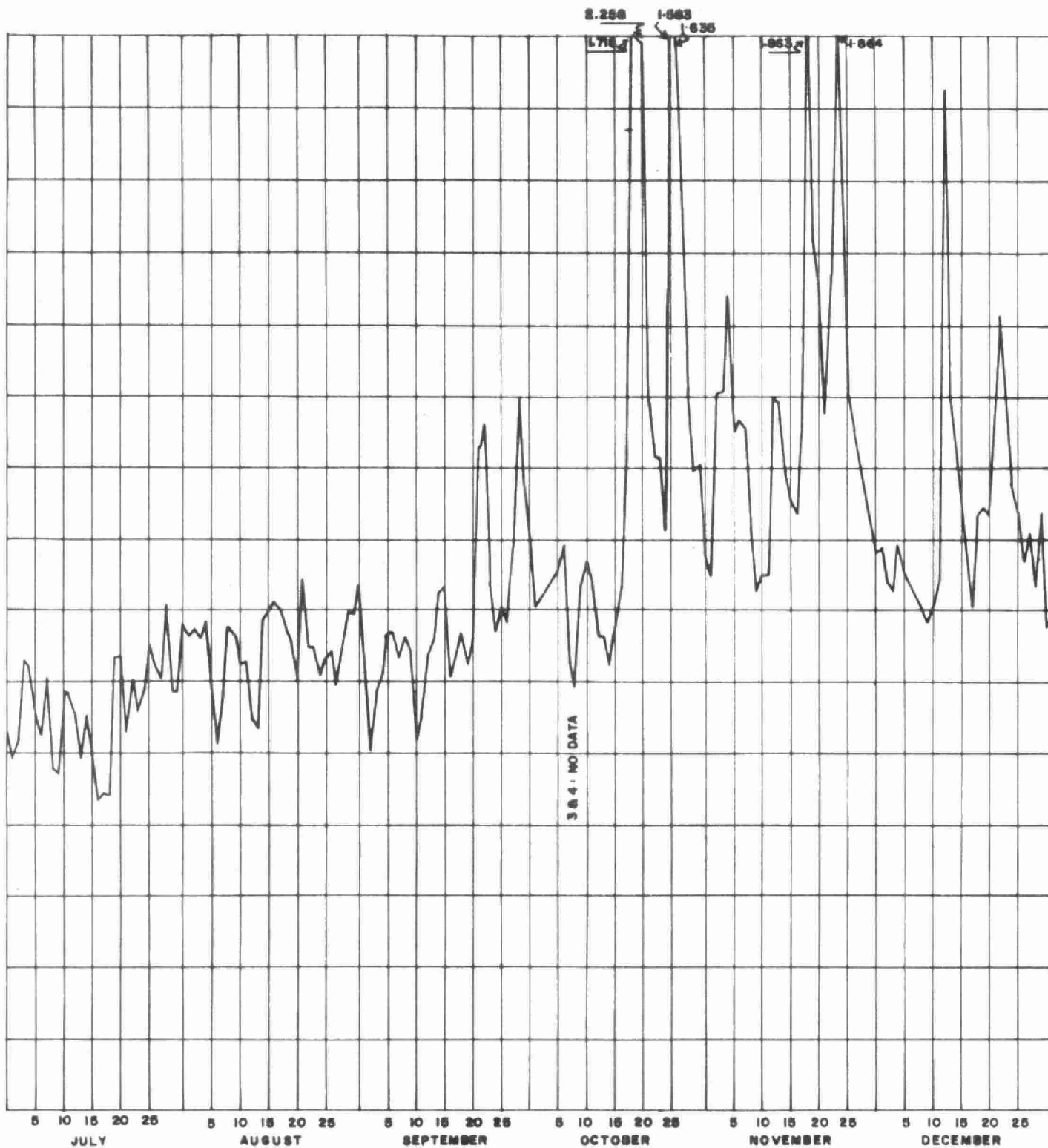
DAILY FLOW GRAPH

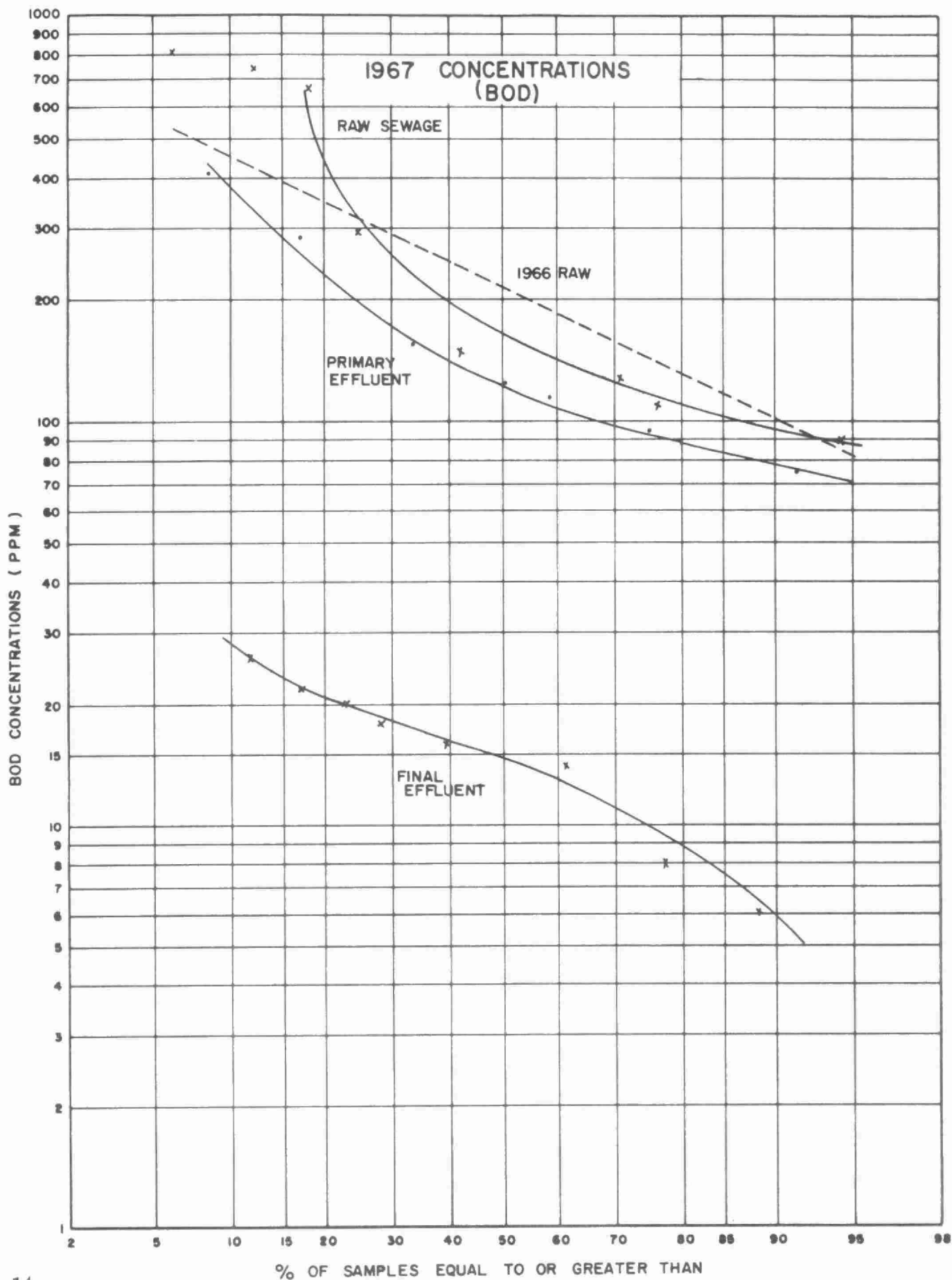
The Daily Flow Graph showed that high flows were received at the plant during the latter part of March, twice in the month of October and also twice in the month of November. These high flows were caused by rainfall and thawing.

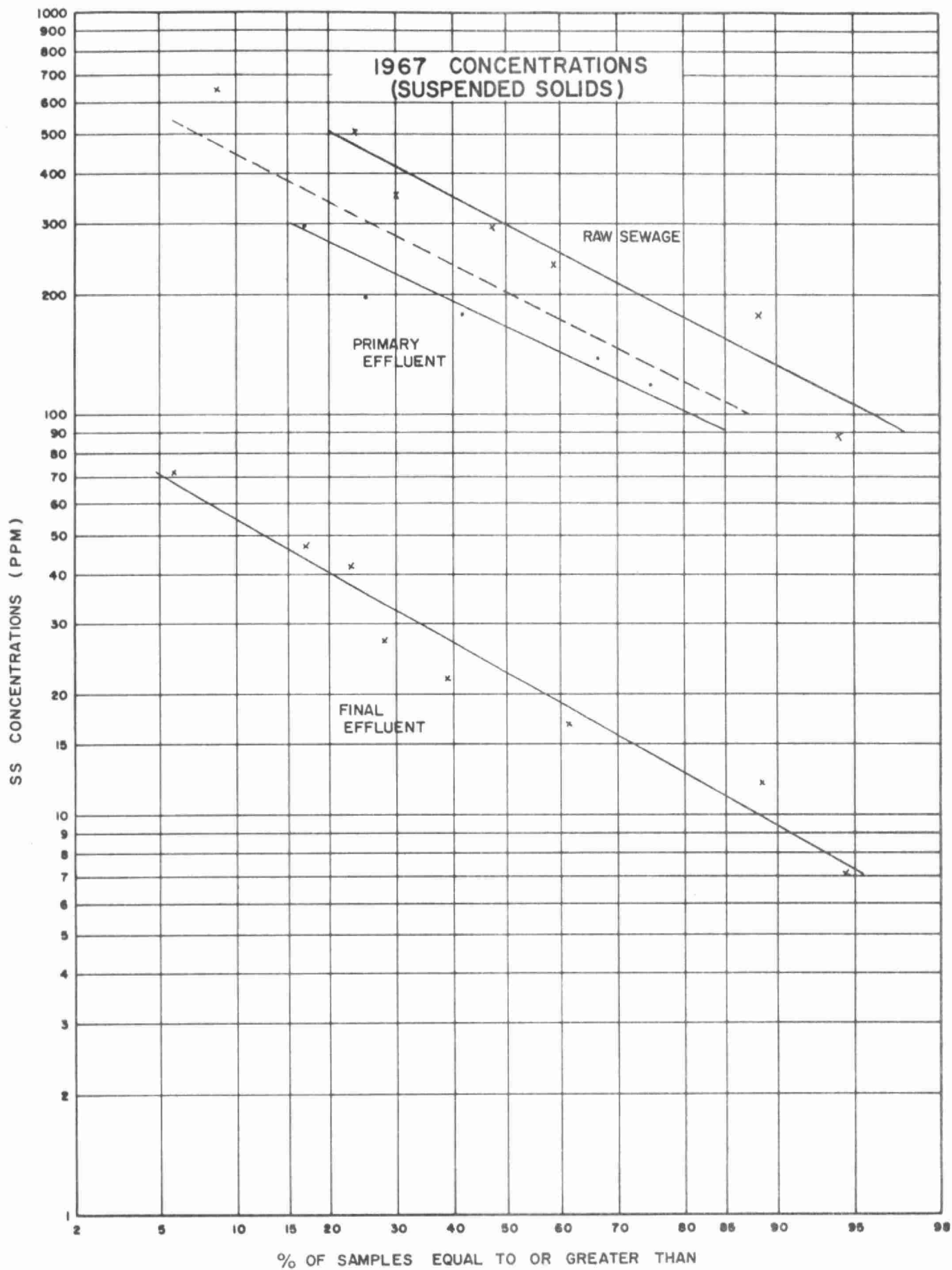


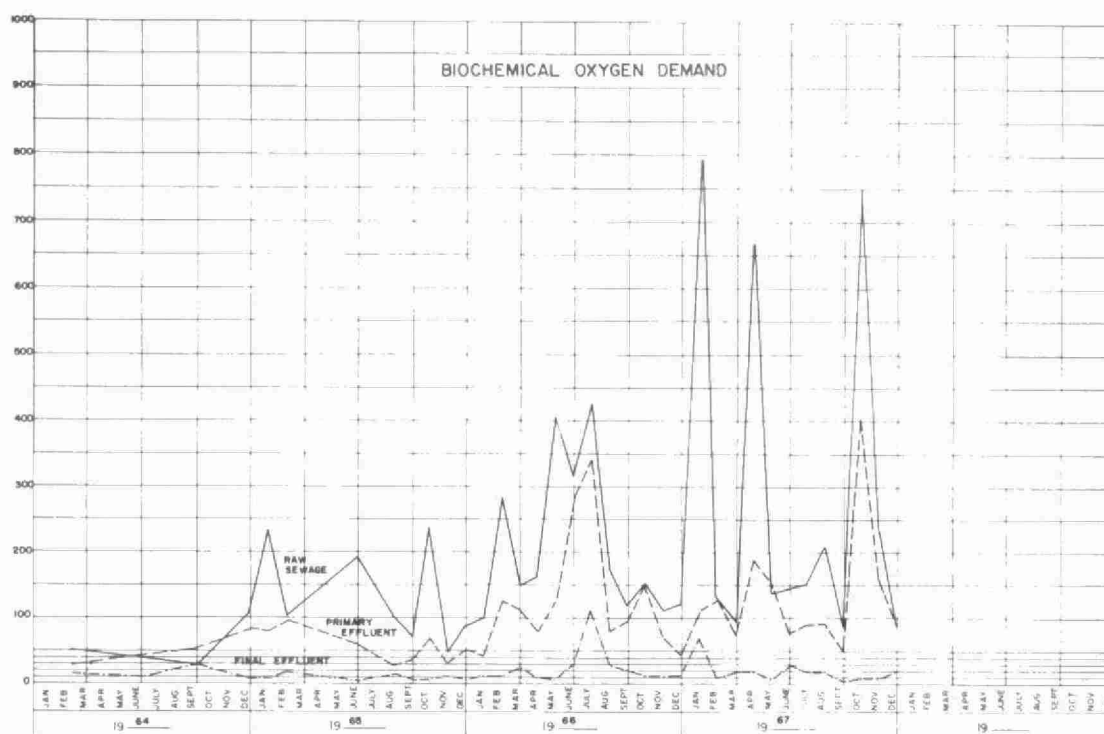




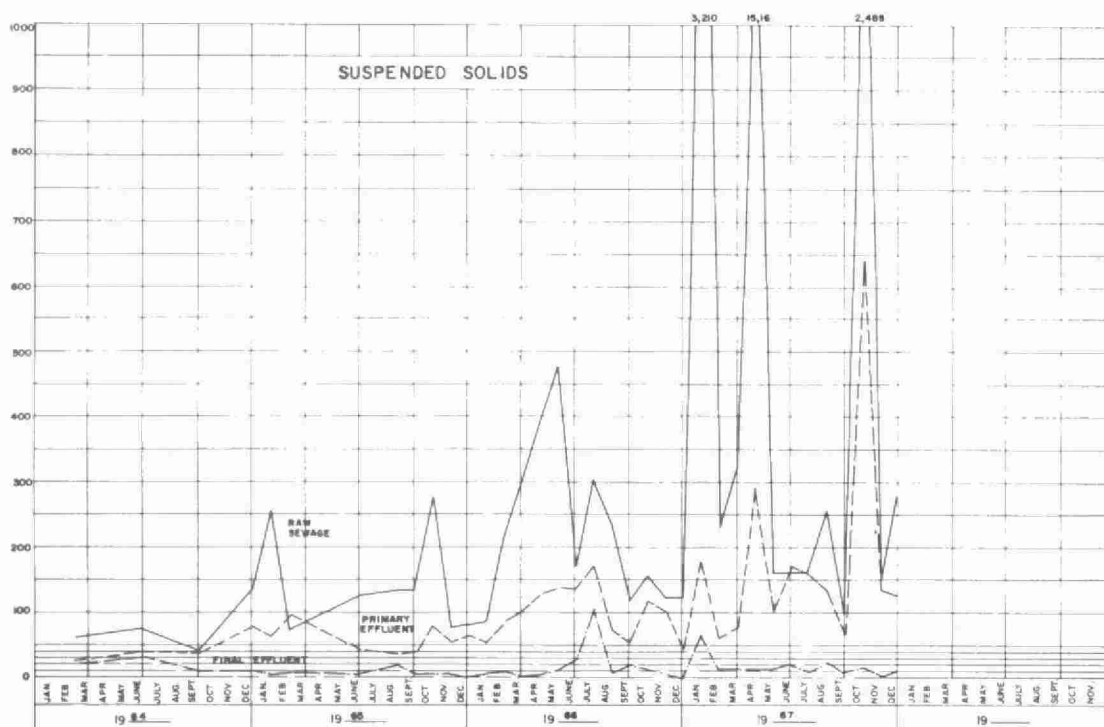








MONTHLY VARIATIONS



GRIT, B.O.D AND S.S. REMOVAL

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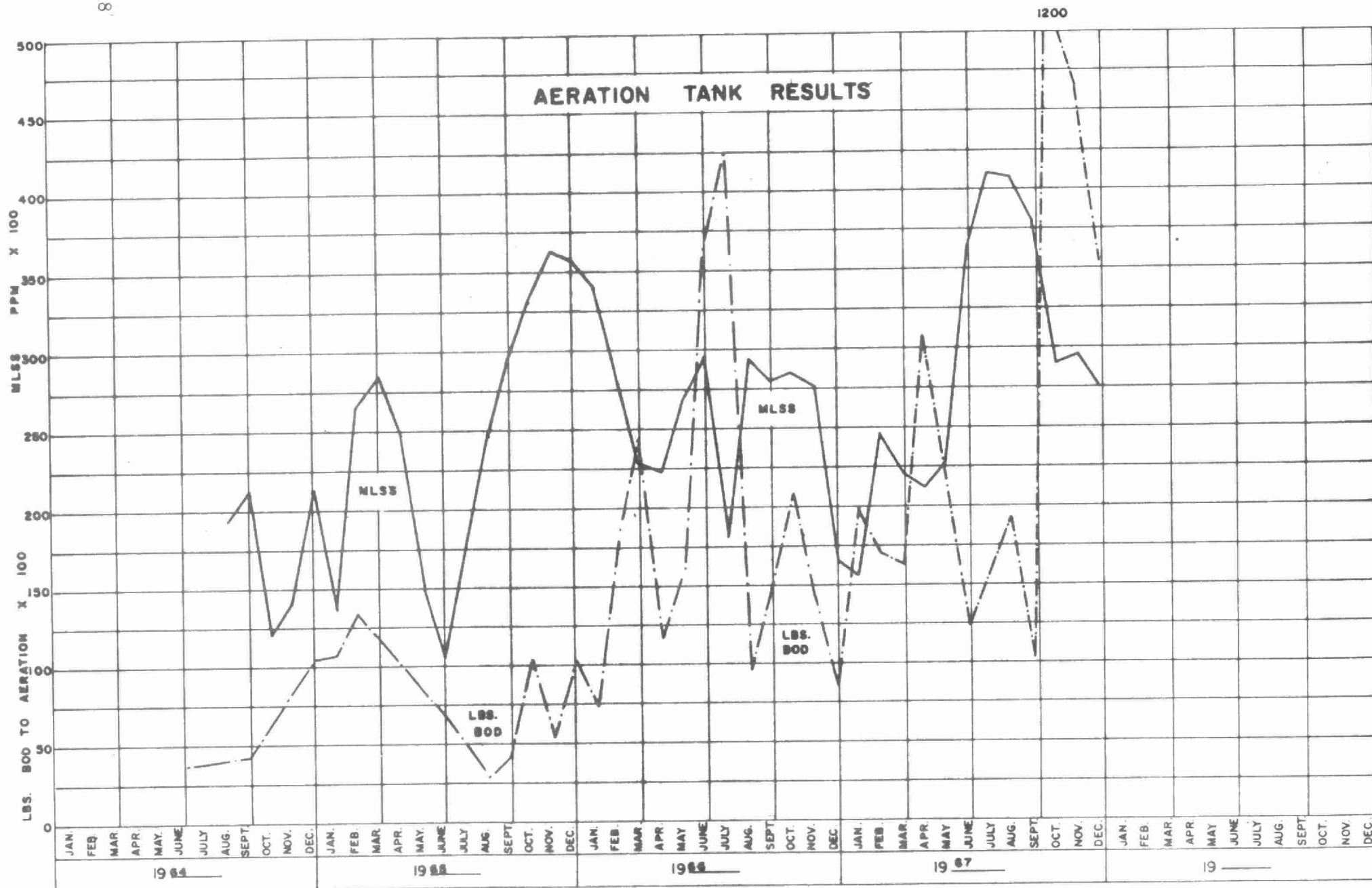
MONTH	B. O. D.				S. S.				GRIT REMOVAL CU. FT.
	INFLUENT PPM.	EFFLUENT PPM.	% REDUCTION	TONS REMOVED	INFLUENT PPM.	EFFLUENT PPM.	% REDUCTION	TONS REMOVED	
JAN.	800	66	91.8	69.48	3210	69	97.8	234.38	11
FEB.	128	8	93.8	84.43	236	14	94.1	15.62	7
MAR.	92	13	85.9	8.64	332	13	96.1	37.90	16
APR.	655	14	97.9	73.47	1516	13	99.1	172.27	11
MAY	135	7	94.8	12.83	160	12	92.5	14.84	33
JUNE	*	21	-	-	*	21	-	-	-
JULY	100	16	84.0	7.44	166	11	99.4	13.73	-
AUG.	154	17	89.0	13.69	262	26	90.1	23.58	9
SEPT.	84	12	98.6	8.60	85	10	88.2	7.79	11
OCT.	750	4.8	99.4	111.12	2488	18	99.3	368.30	12
NOV.	225	7.2	96.8	33.13	156	4	97.4	23.12	19
DEC.	80	13	83.8	8.55	297	11	96.3	36.50	-
TOTAL	-	-	-	356.83	-	-	-	1022.64	129
AVG.	291	15	91.4	29.74	810	19	95.5	85.22	11

* Samples broken in transit.

COMMENTS

The average concentrations of BOD and SS in the influent were 291 and 810 ppm respectively. These samples were obtained from 12, eight-hour composite samples collected at the Kingston WPCP and sent to the OWRC laboratory in Toronto for analysis. It should be noted that very high values were obtained in January, April and October. These values are much higher than those expected from domestic sewage and are caused by the dumping of septic tank contents into the sewer. The plant effluent on the average contained a BOD and SS concentration of 15 and 19 ppm respectively. The plant effluent objectives were met during times of average BOD loadings but were exceeded during the high loadings of January. The percent reduction of BOD and SS of 91.4 and 95.5 percent respectively were satisfactory for an activated sludge treatment plant.

A total of 356 tons of BOD and 1022 tons of SS were removed from the waste in 1967. The amount of grit removed from the waste in 1967 was 11 cubic feet per month. This was a decrease from the 1966 value of 22 cubic feet per month.



AERATION SECTION

MONTH	PRIM. EFFL. B.O.D. PPM.	MLSS. PPM.	LBS. BOD. PER 100 LBS. M. L. S. S.	CUBIC FEET AIR PER LB. BOD. REMOVED
JANUARY	106	1565	15	6352
FEBRUARY	121	2459	8	3021
MARCH	75	2216	9	3346
APRIL	185	2143	25	1102
MAY	153	2270	17	1501
JUNE	75	3669	4	4303
JULY	88	4117	5	3932
AUGUST	90	4174	5	2962
SEPTEMBER	50	3800	3	3831
OCTOBER	400	2899	50	346
NOVEMBER	154	2959	20	887
DECEMBER	140	2750	16	1234
TOTAL	-	-	-	-
AVERAGE	136	2910	15	2735

COMMENTS

The average mixed liquor SS concentration in the aeration tanks in 1967 was 2900 ppm. The loading on the aeration section was 15 pounds of BOD per 100 pounds of mixed liquor SS.

DIGESTER OPERATION

MONTH	SLUDGE TO DIGESTERS			SLUDGE FROM DIGESTERS			S U P E R N A T A N T	
	GALLONS	% SOLIDS	% VOL MAT	GALLONS	% SOLIDS	% VOL MAT	TO DRYING BED GALLONS	% TOTAL SOLIDS
JAN.	57700	-	-	-	-	-	0	0.56
FEB.	64300	3.55	77.75	-	6.45	52.56	0	0.50
MAR.	86500	3.51	80.60	-	5.75	87.00	0	2.15
APR.	100100	2.50	66.40	1000	5.65	49.56	0	1.14
MAY	110500	3.63	70.79	1000	6.08	52.63	0	1.59
JUNE	126000	4.81	65.49	-	3.72	55.65	0	3.11
JULY	150800	4.00	63.50	-	-	-	34,600	2.80
AUG.	173500	3.77	67.10	-	3.64	57.69	125,100	3.55
SEPT.	129900	-	-	20000	-	-	113,200	3.51
OCT.	114200	3.50	67.72	18400	-	-	83,000	1.23
NOV.	104500	3.61	67.86	10000	-	-	97,400	1.80
DEC.	101400	5.52	68.60	15000	-	-	35,000	0.18
TOTAL	1319400	-	-	65400	-	-	494,300	-
AVG.	109950	3.84	69.58	10900	5.21	59.18	82,383	1.85

COMMENTS

In 1967, a total of 1,319,000 gallons of sludge was removed from the waste and pumped to the digester for further treatment. From the digester a total of 65,000 gallons was pumped to the sludge drying beds. The concentration of the raw sludge was 3.8 percent and a concentration of the digested sludge was 5.2 percent.

Since the plant is not equipped with a gas meter, the sewage gas production cannot be recorded. However, it should be noted that a substantial amount of gas was produced at the plant for utilization in the heating of the raw sludge and plant buildings.

CHLORINATION

MONTH	PLANT FLOW (MG)	POUNDS CHLORINE	DOSAGE RATE (PPM)
JANUARY	18.932	-	-
FEBRUARY	14.072	-	-
MARCH	21.882	-	-
APRIL	22.924	-	-
MAY	20.052	* 541	3.48
JUNE	16.470	614	3.72
JULY	17.711	706	3.99
AUGUST	19.979	1037	5.19
SEPTEMBER	20.779	942	4.53
OCTOBER	29.822	** 617	2.29
NOVEMBER	30.421	-	-
DECEMBER	25.526	-	-
TOTAL	258.570	4457	-
AVERAGE	21.548	743	3.87

* Chlorination for 24 days

** Chlorination for 28 days

COMMENTS

Chlorination is practised for effluent disinfection. The chlorination season began at the beginning of May and ended near the end of October.

A chlorine dosage of 3.87 ppm was required to obtain a chlorine residual of 0.5 ppm after a 15 minute contact period.

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RECOMMENDATIONS

1. The R. V. Anderson Engineering Report on the enlargement of the sewage pumping stations should be finalized and initiated as soon as possible.
2. Because of the operating problems associated with the disposal of septic tank contents into the sewage treatment plant, efforts should be made for the disposal of this material by some other means.
3. The plant loading has increased to the point where it is now feasible to commence a study of enlarged facilities. In this regard a report will be requested in 1968.

DATE DUE		

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